

# 9th Class 2016

Chemistry	Group-II	Paper-I
Time: 1.45 Hours	(Subjective Type)	Marks: 48

## (Part-I)

### 2. Write short answers to any Five (5) questions: 10

(i) Define biochemistry.

**Ans** The branch of chemistry in which we study the structure, composition and chemical reactions of substances found in living organisms is called biochemistry.

(ii) Define valency with an example.

**Ans** The unique property of an element is valency. It is combining capacity of an element with other elements. It depends upon the number of electrons in the outermost shell. For example, an element, Sodium (Na) has valency (1) while copper has valency (1, 2).

(iii) Write down two properties of positive rays.

**Ans** Following are two properties of positive rays:

1. These rays travel in a straight line in a direction opposite to the cathode rays.
2. Their deflection in electric and magnetic field proves that these are positively charged.

(iv) Differentiate between shells and sub-shells.

**Ans** Shell is the energy level in which electrons revolve around the nucleus, e.g., K, L, M, etc., while a shell consists of sub-shells. The number of sub-shells in a shell is equal to its n value.

(v) Define isotopes with an example.

**Ans** Isotopes are defined as the atoms of an element that have same atomic number but different mass numbers. For example, protium ( $^1_1\text{H}$ ), deuterium ( $^2_1\text{H}$ , or D) are the isotopes of hydrogen.



vi) Define Mendeleev's periodic law.

**Ans** Mendeleev's periodic law states that the properties of the elements are periodic functions of their atomic masses.

vii) Differentiate between periods and groups.

**Ans** The horizontal rows of elements in the periodic table are called as periods. While the vertical columns in the periodic table are called groups.

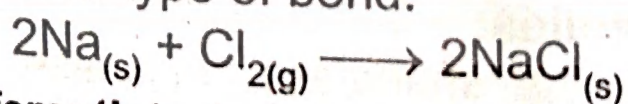
viii) Define shielding effect.

**Ans** The attraction of the nucleus on the electrons of outermost shell is reduced. As a result, an atom experiences less nuclear charge than that of the actual charge. It means that the electrons present in the filled energy levels screen or shield the force of attraction of nucleus felt by the valence shell electrons. This is called as 'shielding effect'.

**3. Write short answers to any Five (5) questions: 10**

(i) Briefly describe the ionic bond.

**Ans** The type of chemical bond, which is formed due to complete transfer of electron from one atom to another atom, is called ionic bond. The formation of NaCl is a good example of this type of bond.



(ii) Differentiate between polar and non-polar covalent bond.

**Ans** When a covalent bond is formed between two different types of atoms, the bond pair is not equally attracted by both the atoms. One of the atoms attracts the electron pair more than the other atom. This atom is called more electronegative. Due to this electronegativity difference, the bond pair of electrons is not equally attracted by both the bonded atoms. Hence a polar covalent bond is formed. On the other hand, if a covalent bond is formed between two similar atoms, the shared pair



of electrons is attracted by both the atoms equally. Such type of bond is called as non-polar bond e.g., in  $H_2$ ,  $Cl_2$ .

(iii) **Why does ice float on water?**

**Ans** Solids are denser than liquids. As ice is solid, it is denser than water. This is because, we may say ice floats on water.

(iv) **Write two properties of covalent compounds.**

**Ans** Following are two properties of covalent compounds:

1. They have usually low melting and boiling points.
2. They are usually bad conductors of electricity. Compounds having polar character in their bonds are conductors of electricity when they dissolve in polar solvents.

(v) **What do you mean by standard atmospheric pressure?**

**Ans** Standard atmospheric pressure is the pressure exerted by atmosphere at sea level.

(vi) **Define vapour pressure.**

**Ans** The pressure exerted by the vapours of a liquid in equilibrium with the liquid at a particular temperature is called vapour pressure of a liquid.

(vii) **Distinguish between amorphous solid and crystalline solid.**

**Ans** **Amorphous solids:**

Amorphous means shapeless. In these solids, particles are not arranged in a regular manner. Moreover, they do not have sharp melting point e.g., rubber, glass, etc.

**Crystalline solids:**

In these solids, the particles are arranged in a definite three-dimensional pattern. These solids have definite faces or surfaces. Each face has definite angles with the other. They have sharp melting points e.g., diamond, sodium chloride, etc.

(viii) **What is meant by transition temperature?**

**Ans** The temperature at which one allotropic form changes into another is called as transition temperature.



**Write short answers to any Five (5) questions: 10**

**What is the difference between solute and solvent?**

**Ans** The component of the solution which is present in smaller quantity is called 'solute'; While the component of the solution which is present in larger quantity is called 'solvent'.

**i) How one molar solution is prepared?**

**Ans** One molar solution is prepared by dissolving 1 mole (molar mass) of the solute in sufficient amount of water to make the total volume of the solution up to  $1 \text{ dm}^3$  in a measuring flask. For example, 1 M solution of NaOH is prepared by dissolving 40 g of NaOH in sufficient water to make the total volume  $1 \text{ dm}^3$ .

**ii) What is the difference between anode and cathode?**

**Ans** The electrode connected to positive terminal is called anode and electrode connected to the negative terminal is called cathode.

**iv) What are non-electrolytes? Give an example.**

**Ans** The substances, which do not ionize in solution and do not allow the current to pass through their solutions, are called non-electrolytes. For example, sugar solution and benzene are non-electrolytes.

**v) What is redox reaction?**

**Ans** The chemical reactions in which the oxidation state of one or more substances changes are called as oxidation-reduction or redox reactions.

**vi) Write any two chemical properties of halogens.**

**Ans** Following are the two chemical properties of halogens:

1. Most of the halogens are non-metals. Thus they usually do not react with water.
2. They do not react with dilute acids because non-metals are themselves electron acceptors.



(vii) Write the names or symbols of any four elements, Noble Gases.

**Ans** The symbols of four elements of Noble Gases:

- |                |                 |
|----------------|-----------------|
| 1. Helium (He) | 2. Neon (Ne)    |
| 3. Argon (Ar)  | 4. Krypton (Kr) |

(viii) Write any two uses of sodium.

**Ans** Following are the two uses of sodium:

1. It is used to produce yellow light in sodium vapour lamps.
2. It is used as a reducing agent in the extraction of metals like  $Ti$ .

### (Part-II)

**NOTE:** Attempt any TWO (2) questions.

**5.(a) Write any five characteristics of mixture. (5)**

**Ans** Following are the five characteristics of mixture:

1. Mixture is formed by the simple mixing up of the substances.
2. Mixture shows the properties of the constituents.
3. Mixtures do not have fixed composition.
4. The components of the mixture can be separated by simple physical methods.
5. Mixtures do not have sharp and fixed melting points.

**(b) What is difference between Rutherford's and Bohr's Atomic Theory? (4)**

**Ans** Differences between Rutherford's and Bohr's atomic theory:

Rutherford's atomic theory	Bohr's atomic theory
(i) It was based on classical theory.	(i) It was based on quantum theory.
(ii) The electrons revolve around the nucleus.	(ii) The electrons revolve around the nucleus in orbits of fixed energy.



- (iii) No idea about orbits was introduced.
- (iv) The atoms should produce continuous spectrum.
- (v) Atoms should collapse.

- (iii) The orbits have angular momentum.
- (iv) The atoms should produce line spectrum.
- (v) Atoms should exist.

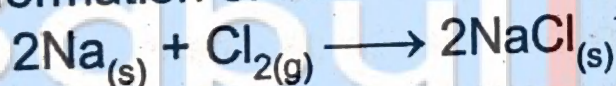
6.(a) Define ionic bond. Explain different steps in the formation of NaCl. (5)

**Ans** Definition of Ionic Bond:

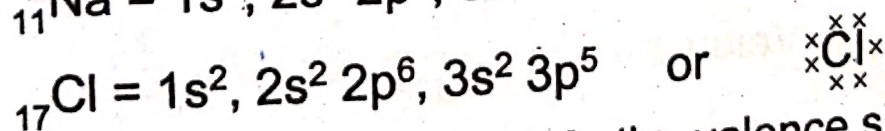
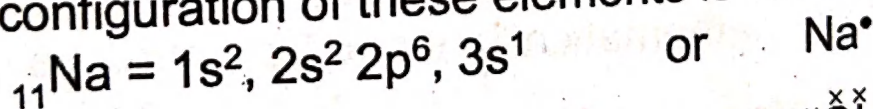
The elements of Group-1 and Group-2 being metals have the tendency to lose their valence electrons forming positively charged ions; whereas non-metals of Group-15 to Group-17 have the tendency to gain or accept electrons. They are electronegative elements with high electron affinities. If atoms belonging to these two different groups, metals and non-metals, are allowed to react, chemical bond is formed. This type of chemical bond, which is formed due to complete transfer of electron from one atom to another atom, is called ionic bond.

**Formation of NaCl:**

The formation of NaCl



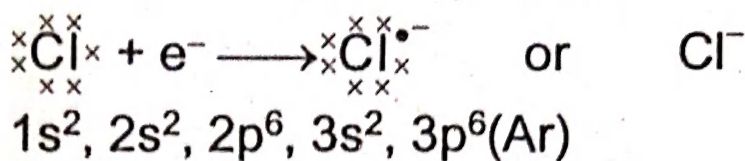
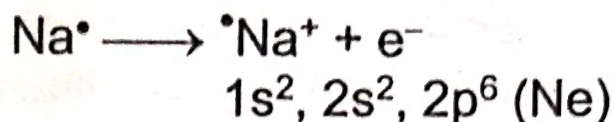
Sodium chloride is a simple compound formed from sodium ( $Z = 11$ ) and chlorine ( $Z = 17$ ). The ground state electronic configuration of these elements is shown below:



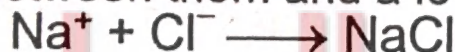
The frame indicates electrons in the valence shells of these elements; sodium has only one electron and chlorine has seven electrons. Sodium being electropositive element has the tendency to lose electron and chlorine being an electronegative element, has the tendency to gain electron. Therefore, they form positive and negative ions by losing and gaining electrons



respectively, and their electronic configuration resembles with the nearest noble gases.



By losing one electron from the outermost shell, sodium becomes  $\text{Na}^+$  ion and it is left with 8 electrons in the second shell which will now become the valence shell. By gaining one electron, chlorine atom now also has eight electrons in its outermost shell and becomes  $\text{Cl}^-$  ion. Both these atoms are now oppositely charged ions. They stabilize themselves by combining with each other due to electrostatic force of attraction between them and a low energy state.




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**(b) Define Boyle's law and write its experimental verification. (4)**

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**Ans** In 1662, Robert Boyle studied the relationship between the volume and pressure of a gas at constant temperature. He observed that volume of a given mass of a gas is inversely proportional to its pressure provided the temperature remains constant.

According to this law, the volume (V) of a given mass of a gas decreases with the increase of pressure (P) and vice versa. Mathematically, it can be written as:

$$\text{Volume} \propto \frac{1}{\text{Pressure}} \quad \text{or} \quad V \propto \frac{1}{P}$$

$$\text{Or} \quad V = \frac{k}{P} \quad \text{or} \quad VP = k = \text{constant}$$

Where 'k' is proportionality constant. The value of k is same for the same amount of a given gas. Therefore, Boyle's law can be stated as "the product of pressure and volume of a fixed mass of a gas is constant at a constant temperature."



If  $P_1 V_1 = k$  Then  $P_2 V_2 = k$   
 where  $P_1$  = initial pressure  $P_2$  = final pressure  
 $V_1$  = initial volume  $V_2$  = final volume

As both equations have same constant, therefore, their variables are also equal to each other.

$$\therefore P_1 V_1 = P_2 V_2$$

This equation establishes the relationship between pressure and volume of the gas.

**7.(a) Define solubility and describe the effects of temperature on solubility. (5)**

**Ans** For Answer see Paper 2015, (Group-I), Q.7.(b).

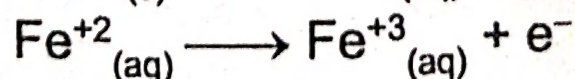
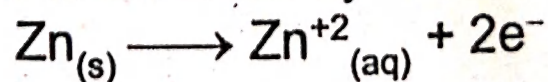
**(b) Describe oxidation and reduction in term of loss or gain of electron. (4)**

**Ans** Oxidation and Reduction in Terms of Loss or Gain of Electron:

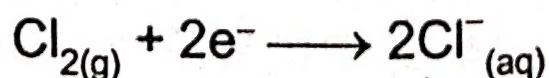
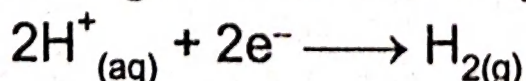
In chemistry, there are many chemical reactions which do not involve oxygen or hydrogen, but they are considered redox reaction. To deal with these reactions, new concept 'loss or gain of electrons' is used. Therefore, reactions which involve 'loss or gain of electrons' are also called oxidation and reduction reactions.

According to this concept:

Oxidation is loss of electrons by an atom or an ion. e.g.,



Reduction is gain of electrons by an atom or an ion. e.g.,



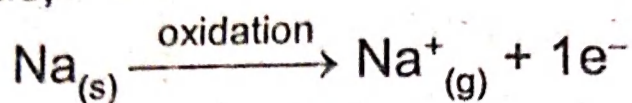
The overall redox reaction is sum of both processes, written as



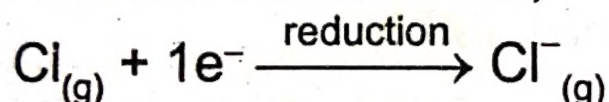


Let us have another simple example to understand this concept. A reaction between sodium metal and chlorine takes place in three steps.

First sodium atom loses an electron, to form sodium ion, such as;

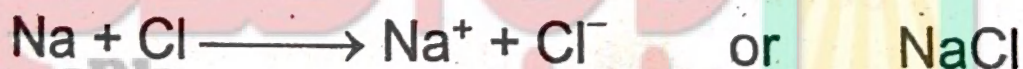


Simultaneously, this electron is accepted by chlorine atom (reduction process), as chlorine atom needs one electron to complete its octet. As a result, chlorine atom changes to chloride ion. Such as;



Ultimately, both these ions attract each other to form sodium chloride.

Complete redox reaction is sum of the oxidation and reduction reactions between sodium and chlorine atoms and it is represented as



Chlorine element exists as a molecule ( $\text{Cl}_2$ ) not as atoms ( $\text{Cl}$ ). Therefore, the actual balanced chemical reaction is represented as:

